



# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

## WHAT WORKS FOR DIGITAL FINANCIAL SERVICES IN AGRICULTURAL DEVELOPMENT?



# USAID

FROM THE AMERICAN PEOPLE

# GLOSSARY

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<b>CFA</b>	Connected Farmer Alliance
<b>CGAP</b>	Consultative Group to Assist the Poor
<b>DFS</b>	Digital Financial Services
<b>DIV</b>	Development Innovation Ventures
<b>FSP</b>	Financial Service Provider
<b>GFSS</b>	Global Food Security Strategy
<b>IFC</b>	International Finance Corporation
<b>MFI</b>	Microfinance Institution
<b>M-PESA</b>	a mobile-based money transfer service in Kenya
<b>IBLI</b>	Index-Based Livestock Insurance
<b>POS</b>	Point of Sale
<b>R&amp;D</b>	Research and Development
<b>RCT</b>	Randomized Control Trial
<b>USAID</b>	United States Agency for International Development
<b>USSD</b>	Unstructured Supplementary Service Data

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**There are several factors that are common among more successful implementations of DFS for agriculture projects.**

<b>Complexity factors</b>	<b>Design factors</b>	<b>Operational factors</b>	<b>Growth factors</b>
<ul style="list-style-type: none"> <li>• Multi-faceted solutions</li> <li>• Awareness of downside risks</li> </ul>	<ul style="list-style-type: none"> <li>• Responding to seasonal incomes/ outflows</li> <li>• Leveraging behavioral insights</li> </ul>	<ul style="list-style-type: none"> <li>• Empowering (not replacing) field staff</li> <li>• Careful change management</li> <li>• Digitizing beyond customer interface</li> </ul>	<ul style="list-style-type: none"> <li>• Not scaling too fast</li> <li>• Leveraging donor capital for innovation</li> </ul>

**To improve the effectiveness of DFS for agriculture interventions, a coalition of governments, donors, NGOs, and the private sector need to work together to build the ecosystem.**

<b>Strategic recommendations</b>	<b>Process recommendations</b>	<b>Product recommendations</b>
DFS for agriculture needs strategic, long term investments in market building. The challenges are complex and require strong partnerships. Donors have a crucial role in subsidizing risk and innovation	More emphasis is needed on customer segmentation and service design. There are opportunities for digitization along the customer journey, but these need to be better understood.	Emphasizing digital savings products and developing use cases for digital payments should be a priority. Products need to link more closely to farmers activities and aspirations.



# SECTION I: INTRODUCTION

## I.1 BACKGROUND

Hunger and poverty reduction are two critical, complex, and interrelated challenges at the heart of the international development agenda. The development of the agricultural sector is central to the challenge of how families, communities, and countries in some of the world's poorest regions can grow out of poverty, reduce food insecurity, build resilience, and ultimately achieve self-reliance. While agriculture provides the primary source of income for most of the world's poor, agricultural development supports an inclusive model of economic growth.

The factors hindering agricultural development are many and complex. One of the most acute and well-established constraints is limited access to the financial services. Financial services can enable improved outcomes for the rural poor in several ways, including:

**Increased productivity:** Farmers, particularly those with smaller plots, are often constrained by an inability to invest in modern inputs. To make one-off investments, a farmer needs a lump sum of money available at the right time to make the necessary purchases. Financial services can help make this lump sum available, providing an opportunity for farmers to escape a cycle of low investment, low returns, and low income.



### **Higher incomes and diversified livelihoods:**

Given the precarious nature of agricultural livelihoods, concentration of investments in one crop can be dangerous. Financial services can open up channels to alternative and higher incomes through investment in higher value crops, value addition through processing or standards and certifications, or the ability to take advantage of new markets.

**Greater resilience:** For those living in poverty or slightly above poverty level, the impact of a shock (such as a drought or a sudden health emergency) can be catastrophic. Financial services can provide the opportunities to smooth consumption and build resilience by insuring against risk, accumulating financial buffers, and opening channels for emergency funds when most needed.

The digital revolution provides an unprecedented opportunity to overcome some of the major challenges that restrict the rural poor from accessing and effectively using financial services. The challenges are numerous and interrelated—some relate to characteristics of rural populations, some to the nature of agricultural activities, some to information asymmetries, and others to the cost of operating in rural environments. The [USAID Digital Financial Services \(DFS\) for Agriculture Guide](#) summarizes some of the roadblocks faced by smallholder farmers in accessing financial services, and suggests solutions that can be enabled by DFS.

**Table I: Summary of Digital Agriculture Interventions**

 ROADBLOCK	 SOLUTION ENABLED BY DIGITAL FINANCIAL SERVICES
Limited ability to manage post-harvest loss and speculate for higher prices for harvests	Access to storage facilities with inventory-based credit
Smallholder farmers cannot save for long-term investments	Savings products and services
Appropriate credit products don't exist for smallholder farmers	Lower transaction costs to lend to smallholder farmers, making credit more available
Cost of buying quality and quantity inputs is prohibitive and risky	Increased purchasing power, reduced risk, decreased transaction costs
Smallholder farmers not competitive in commercial supply chains	Digitizing payments throughout the value chain translate to lower costs for buyers (and farmers) and increase price transparency
Managing and mitigating weather risks to crops	Weather-indexed microinsurance, purchase of weather risk-mitigating farm equipment (i.e., drip irrigation, climate resilient seeds)
Women disempowered in decision-making in agriculture	Improved access to markets and better control of funds



## I.2 FOCUS

The purpose of this case study is to synthesize and highlight the latest evidence of what has worked in achieving impact for digital finance implementations in agricultural development, in particular for smallholder farming households in poor countries.

The easiest way to think of digital financial services in this context is as the digitization of the relationship between the customer and the financial service provider (FSP)—usually via a mobile phone (as with [M-PESA](#)), a computer, or a point-of-sale (POS) device. However, while the customer is making and receiving funds via mobile, there may be a significant, cash- and paper-heavy infrastructure behind it. Conversely, a rural microfinance institution (MFI) that is distributing loans to a farmer in cash could have a significant technology-driven data analytics platform that helped decide whether to make that loan. The ways that digital technology has changed—and continues to change—financial services for rural populations is not simple.

For the purposes of this case study, we assess the evidence of effectiveness in financial inclusion programming for rural populations where there is at least some digital component. This component may be small, or within a much larger traditional, non-DFS project or program.

## I.3 APPROACH

Despite the progress that has been made in extending the digital finance frontier into rural areas, we have yet to see wide scale adoptions of digital financial solutions among agricultural populations. Therefore, this case study aims to identify the latest evidence of what has been shown to be effective in providing financial services to smallholder farmers, and then assess how digital finance can be leveraged to further develop and scale these models.

The case study takes a global view of the evidence concerning DFS and agricultural finance but wherever possible, focuses on Global Food Security Strategy target countries under Feed the Future (Bangladesh, Ethiopia, Ghana, Guatemala, Honduras, Kenya, Mali, Nepal, Niger, Nigeria, Senegal and Uganda). It is not a compendium of all development programs, trials, DFS products, and their purported impact, but rather a synthesis of the available evidence.

Section 2 considers the state of the evidence around the impact of savings, credit, insurance, and transactional products for smallholder farmers, focusing on academic studies and statistically-robust project evaluations. Section 3 considers more programmatic evidence on the factors behind successful interventions. Section 4 focuses on digital connectivity and the changing nature of digital in rural finance, in particular the role of smartphones. Section 5 provides recommendations for donor programming.

## SECTION 2: THE STATE OF THE EVIDENCE ON IMPACT

This section summarizes the latest available evidence, by product type, on the effectiveness of financial services in improving outcomes for smallholder farmers. While the emphasis is on financial services delivered through digital channels and enabled by digital processes, the digital element is often peripheral to the primary intervention. This section highlights where we are seeing impact, and the next section will focus on what we know from more digitally-focused programs about how DFS can be used as a lever to support these impact channels.

### 2.1 EVIDENCE BY PRODUCT TYPE

#### Payments and transactions

There is good evidence from Kenya<sup>1</sup> that mobile money has had positive impact on the livelihoods of the rural poor. It is estimated that M-PESA has significantly increased per capita incomes and lifted two percent of Kenyan households out of poverty. This impact is most pronounced for women, who have in many cases been enabled to move out of agriculture and into business. While the impact of DFS is not necessarily through agriculture, the impact on rural livelihoods and poverty reduction is significant. Further evidence from banana farmers in Kenya<sup>2</sup> suggests that the positive impact of mobile money on rural households is through the remittance channel. For smallholder farmers receiving remittances from

#### What do we mean by “impact”?

In line with the U.S. Government Global Food Security Strategy (GFSS) results framework, the overarching goal of sustainably reducing global hunger, malnutrition, and poverty is sub-divided into three interrelated and interdependent objectives:

- Objective 1. Inclusive and sustainable agricultural-led economic growth
- Objective 2. Strengthened resilience among people and systems
- Objective 3. A well-nourished population, especially among women and children

This is the framework used in this study to assess whether digital financial services in agriculture interventions are achieving impact.

friends and family, the digital inflows not only directly raise incomes but also lead to greater investment in agricultural inputs and higher profits. Receivers of digital remittances were also shown to reduce risk and liquidity constraints, supporting an earlier study<sup>3</sup> that found that mobile money remittances tended to act as a form of insurance by reducing the impact of negative economic shocks.

1 Suri, Tavneet & Jack, William. (2016). The long-run poverty and gender impacts of mobile money. *Science*. 354. 1288-1292. [10.1126/science.aah5309](https://doi.org/10.1126/science.aah5309).

2 Kikulwe EM, Fischer E, Qaim M (2014). "Mobile Money, Smallholder Farmers, and Household Welfare in Kenya". *PLoS ONE* 9(10): e109804. doi:10.1371/journal.pone.0109804.

3 Suri T, Jack W, Stoker TM (2012). "Documenting the birth of a financial economy."





Digital cash transfers have been demonstrated to be a cost-saving mechanism for large-scale transfers, particularly to sparsely-distributed rural populations. In Niger,<sup>4</sup> mobile phone-based cash transfers significantly reduced costs for recipients in obtaining the cash transfer; and the agency's variable implementation costs of. Households receiving mobile transfers (who relied on agriculture as their primary income source) had increased dietary diversity and their children had higher daily nutritional intake. This was partly due to time savings (mobile transfer recipients spent less time traveling and waiting for their transfer) as well as increased intra-household bargaining power for women.

There is little evidence to date on the value of digitizing value chain payments, though this is often held up as a high potential intervention for DFS in agriculture. The Connected Farmer Alliance (CFA)—a public-private partnership between Feed the Future, Vodafone, and TechnoServe to digitize the flow of money and information along the nut value chain in Kenya—found

that digitization of payments resulted in savings of \$45,614 per year driven primarily by the removal of cash withdrawal charges and no longer needing to cover the insurance premium covering cash in transit. Other similar projects, such as one to digitize payments in Uganda's coffee value chain,<sup>5</sup> demonstrate the various difficulties in operationalizing such a system.

### Savings

Evidence from a randomized control trial (RCT) with tobacco farmers in Malawi<sup>6</sup> found that farmers who had their harvest incomes paid electronically into bank accounts were more likely to save money in the months preceding the next planting season and increased their usage of agricultural inputs in that season. Increased inputs led to increased agricultural output, higher farm-related sales, and higher profits for the farmer; and household expenditures were 10.8 percent higher than in the control group. Encouragingly, usage of the bank accounts continued one year after the trial, implying that the farmers found some value in the savings mechanism. This is consistent with an

4 Jenny C. Aker, Rachid Boumnijel, Amanda McClelland and Niall Tierney (2014). "Payment Mechanisms and Anti-Poverty Programs: Evidence from a Mobile Money Cash Transfer Experiment in Niger."

5 Amani M'Bale, Rashmi Pillai, and Nathan Were (2018). "Digitizing Agricultural Payments Lessons from Uganda's Coffee Value Chain."

6 Lasse Brune, Xavier Giné, Jessica Goldberg and Dean Yang (2016). "Facilitating Savings for Agriculture: Field Experimental Evidence from Malawi."

earlier study in Western Kenya<sup>7</sup> that found that farmers were willing to make forward investments in fertilizer at harvest time as a means of saving to invest in next season's crop.

In a study of fertilizer uptake among farmers in Mozambique,<sup>8</sup> researchers found that the offer of a mobile (non-digital) savings account incentivized farmers to save money rather than invest in fertilizer in subsequent seasons. A treatment group with access to fertilizer subsidies alone continued to invest in fertilizer in later planting cycles; a group with access to a savings product, however, preferred to accumulate savings as a buffer stock—a form of self-insurance. Those using the savings accounts were found to demonstrate improvements in well-being, in the form of higher consumption levels.

MyAgro, a USAID grantee, has developed a successful mobile layaway solution that allows smallholder farmers in Mali and Senegal to incrementally save money via their mobile phones for investment in farm inputs. Though no robust impact evidence yet exists, MyAgro has reached 34,000 customers and claims to have increased yields by 50–100 percent and annual net farmer incomes by \$145.

## Insurance

Although there have been several pilots and high-profile initiatives to support index insurance products for smallholder farmers, the impact of such approaches remains unclear. A systematic review of the literature<sup>9</sup> found that “some positive effects of index-insurance

have been established, yet a number of adverse net income effects results have been reported too.”

Evidence from a rainfall-based index insurance program in Northern Ghana<sup>10</sup> found that the presence of the insurance policy induced farmers to invest more in fertilizer usage, land cultivation and total farming expenditures, and to select riskier activities. The intervention was found to improve some aspects of household welfare (such as ability to absorb shocks, measured by the number of meals missed); there was no significant impact on an aggregate measure of household welfare.

A large scale agricultural insurance intervention in India<sup>11</sup> demonstrated the heterogeneity of impact between cultivators and agricultural wage laborers. The presence of a rain-indexed insurance policy incentivized farmers to invest in higher-yielding, riskier production methods; however, the intervention excluded farm workers and was shown to destabilize their employment opportunities. Further evidence from India<sup>12</sup> showed that rainfall insurance could help farmers to manage risk and shift production away from subsistence crops towards cash crops that are more sensitive to rainfall; however, the insurance products needed to be significantly subsidized (or free) to generate much demand. While discounts and financial literacy interventions can increase uptake of insurance, demand continues to be very low when policies are sold at actuarially fair prices.<sup>13</sup>

7 Esther Duflo, Michael Kremer and Jonathan Robinson (2011). “Nudging Farmers to Use Fertilizer: Theory and Experimental Evidence from Kenya.”

8 Carter et al. (2016). “Savings, Subsidies, and Technology Adoption: Field Experimental Evidence from Mozambique.”

9 Marr, Ana, Winkel, Anne, van Asseldonk, Marcel, Lensink, Robert and Bulte, Erwin (2016). “Adoption and impact of index-insurance and credit for smallholder farmers in developing countries: A systematic review.” *Agricultural Finance Review*, 76 (1), pp. 94–118. ISSN 0002-1466.

10 Dean Karlan Robert Osei Isaac Osei-Akoto Christopher Udry (2014). “Agricultural decisions after relaxing credit and risk constraints.”

11 Ahmed Mushfiq Mobarak and Mark Rosenzweig (2014). *Risk, Insurance and Wages in General Equilibrium*.

12 Cole, Shawn, Xavier Gine, Jeremy Tobacman, Petia Topalova, Robert M. Townsend, and James Vickery. 2013. “Barriers to Household Risk Management: Evidence from India.”

13 J-PAL, CEGA, and ATAI Policy Bulletin. 2016. “Make it Rain.” Cambridge, MA: Abdul Latif Jameel Poverty Action Lab, Center for Effective Global Action, and Agricultural Technology Adoption Initiative.

## Credit

A randomized control trial of One Acre Fund's (IAF) work in Western Kenya has provided good evidence of the impact of their digitally-enabled "market bundle" approach. Rather than merely providing a loan, One Acre Fund provides a package of seed, fertilizer, and training—all on credit to farmers of maize and beans. The study found a 34 percent increase in maize yields, and approximately 20 percent increases in profits on both crops.

Further evidence from Nigeria, Malawi, Tanzania and Uganda<sup>14</sup> found that the link from formal credit to agricultural investment may be less straightforward than previously thought. The researchers found that very few farmers use credit to finance inputs and were more likely to use loans to fund non-farm enterprises (and consumption) and use the cash generated from these enterprises to finance farm inputs. Though this result says little about credit constraints, it does indicate that demand may be greater for earned cash rather than more digital credit to finance inputs.

Credit is not just important to allow investment in inputs. A study in Zambia<sup>15</sup> found that the provision of seasonal credit during the lean season (the period between harvests when farmers often resort to reducing food consumption, informal borrowing, and short-term work on other farms) could increase agricultural output and farmer wellbeing. These loans were typically smaller than input loans, and the impact was greatest on the poorest farmers in the sample. Though the loan products were in the form of cash or food, the researchers predicted that the use of mobile money or other alternative delivery channels could increase the cost-effectiveness of implementation.

## Hybrids and bundled products

The standard framework for understanding the supply of financial services based on payments, credit, savings, and insurance can in some cases fail to represent the spectrum of financial services for farmers. A more demand-centric approach based on the various problems that farmers face, paired with financial services that offer a solution, opens possibilities for combinations of some of these services.

While much of the effort in the agricultural finance space is around increasing the supply of credit to farmers, there is some evidence that the agricultural credit providers are constrained by capital constraints as well as by risk. In other words, if lenders knew that crops were insured, they may be more willing to lend. There is some evidence from Ghana<sup>16</sup> that mitigating risk for smallholder farmers (via rainfall index insurance), even without an infusion of capital, can lead to an increase in investment. Conversely, there is also evidence that the bundling of (health) insurance with microcredit for rural customers can *decrease* demand for loans as customers are disincentivized by the additional cost of the premium.<sup>17</sup>

### 2.2 EVIDENCE BY TYPE OF FARMER

The effectiveness of DFS for agriculture interventions varies considerably due to differences in context, value chain, geography and the demographics of target populations. Smallholder families across the world have diverse characteristics and the outcomes that they can derive from DFS will vary considerably. To help frame the segments of agricultural households, CGAP (Consultative Group to Assist the Poor, part of the World Bank) have developed a segmentation of

14 Adjognon SG, Liverpool-Tasie LSO, Reardon TA. "Agricultural input credit in Sub-Saharan Africa: Telling myth from facts." *Food Policy*. 2017;67:93-105.

15 Günther Fink, B. Kelsey Jack, and Felix Masiye (2018). "Seasonal Liquidity, Rural Labor Markets and Agricultural Production" Working Paper, April 2018.

16 Dean Karlan Robert Osei Isaac Osei-Akoto Christopher Udry (2014). "Agricultural decisions after relaxing credit and risk constraints."

17 Banerjee, Abhijit, Esther Duflo, and Richard Hornbeck. 2014. "Bundling Health Insurance and Microfinance in India: There Cannot Be Adverse Selection If There Is No Demand."

smallholder households<sup>18</sup> based on what they grow and how they produce it; what they consume at home and what they sell in the market; and how those markets are organized.

The evidence suggests that for most commercial smallholder farmers (producing in tight value chains and with good links to markets), a range of specialized DFS offerings that link to agricultural investment could add value. Evidence from Mali<sup>19</sup> suggests that wealthier farmers with more land, who spend more on inputs, and enjoy higher output and profits with a higher marginal return on investment in their crops are more likely to access credit than low marginal-return farmers. Clients of Opportunity International farming tobacco in Malawi<sup>20</sup>—another tight value chain—were shown to derive benefits from a commitment savings product to save for investment in next season's harvest.

For poorer farmers, working in subsistence agriculture or in looser value chains, the priority tends to be for DFS products that help smooth consumption, feed their households through the lean season, and build resilience. Though it might be expected that demand for insurance would be highest among the most vulnerable, the evidence suggests that the upfront premium remains a significant barrier for low income smallholder households, and therefore other products (e.g., savings and remittances) are used to provide a safety net.

The purpose of this section is to place a practical lens on the implementation of DFS programs: given what we know about how DFS can support agricultural development and rural livelihoods, how can the public, private, and development sectors support the successful implementation of DFS for agriculture programs? There are several factors that can make

**Table 2**

SEGMENT OF SMALLHOLDERS	CHARACTERISTICS	ROLE OF DIGITAL FINANCIAL SERVICES
<b>Non-commercial smallholders</b>	Landless, or up to 1 hectare Staple crops Production consumed by household Little market engagement	Consumption smoothing Commitment savings Remittances Group loans
<b>Commercial smallholders in loose value chains</b>	1-2 hectares Staples and some cash crops Some production consumed by household Reliable surplus of staples sold informally	Commitment savings Passbook savings Regular payments Input credit Group loans
<b>Commercial smallholders in tight value chains</b>	At least 2 hectares Cash crops Sold through contract farming Reliable surplus of staples, some consumed by household	Input credit Asset financing Harvest-linked savings Value chain payments Crop insurance

Source: CGAP Segmentation of Smallholder Households and author

<sup>18</sup> CGAP Segmentation of Smallholder Households.

<sup>19</sup> Beaman, Lori, Dean Karlan, Bram Thuysbaert, and Christopher Udry (2015). "Self-Selection into Credit Markets: Evidence from Agriculture in Mali."

<sup>20</sup> Lasse Brune, Xavier Giné, Jessica Goldberg and Dean Yang (2016). "Facilitating Savings for Agriculture: Field Experimental Evidence from Malawi."



## SECTION 3: COMMON FACTORS BEHIND SUCCESS OR FAILURE OF DFS FOR AGRICULTURE INTERVENTIONS

or break a good program, many of which cannot be predicted ex ante. In this section, we break these up into four broad categories: complexity, design, operations, and innovation.

### 3.1 COMPLEXITY FACTORS

#### Complex challenges need multi-faceted solutions

Getting DFS to work for agriculture is extremely difficult. There are several obstacles, only some of which might be solvable by technological innovation. Often there is a complex mesh of political, physical, geographical, economic, and sociological issues that could hinder an implementation, each of which require their own approach.

The thinking around this issue has developed since the early days of microfinance, when the general approach would focus on the provision of credit, with no other services included in its work with groups of borrowers. The evolution of the financial inclusion sector has since been characterized by the development of a more holistic approach to financial health, which considers a broader array of financial and non-financial services as solutions to the challenges faced by marginalized populations.

There is scant evidence of DFS for agriculture interventions working in isolation. The relative

success of models such as One Acre Fund and the Graduation Approach demonstrates the importance of programmatic activities that address the range of problems faced by smallholder farmers, across space and across time. Several DFS interventions have failed because they have not paid sufficient attention to the value-added services that farmers require to properly leverage the financial service. A farmer may be reluctant to take up a loan if she is not confident she has access to high quality inputs and a stable market to sell her crops after harvesting.

The best practice for DFS interventions in agriculture supports the bundling of DFS products with critical agricultural services at multiple points in the value chain to help farmers access the right inputs when they need them.<sup>21</sup> The [GFSS guidance on financial services](#)<sup>22</sup> now argues that the best practice is to intentionally structure financial interventions as part of a larger program, and to use financial aspects to amplify impact.

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21 GFSS Supplemental Technical Guide Towards Digitally Enabled Global Agriculture and Food Systems.

22 Feed the Future "Global Food Security Strategy Technical Guidance Finance: Unlocking Capital Flows" [www.feedthefuture.gov](http://www.feedthefuture.gov).





Afandi Djauhari/NetHope

### DFS isn't necessarily all upside

The theory of change for digital financial services assumes that, through a range of impact pathways, digitization will positively impact people's livelihoods. Like any innovation however, implementers need to be cautious of the risk associated with replacing an analog system for a digital one. Particularly in rural contexts, where financial services have traditionally been informal, group-based, and underpinned by local social capital, there is evidence that the impact of DFS could in fact be disruptive and negative. An RCT in the Philippines<sup>23</sup> found that, for customers of a rural bank, conversion to mobile banking led to a 20 percent decrease in the average daily balance and frequency of deposits over a two-year period, driven by weakened group cohesion and sensitivity to transaction fees. Further evidence from South Africa<sup>24</sup> suggests that the introduction of formal digital financial services could erode opportunities for informal income generation.

### 3.2 DESIGN FACTORS

#### Financial services for farmers need to account for seasonal distribution of incomes and outflows

Farmers typically receive their incomes in small chunks throughout the year when they sell their harvested crops. Their liquidity varies greatly, based on where they are in the agricultural cycle. Traditional microfinance models, which are characterized by regular (usually weekly) repayments, have tended to fail when mapped to the irregular income patterns of farmers. There is good evidence that tailoring the repayment schedule to the income flows of the farmer can improve farmer outcomes. In Mali, it was found that agricultural lending tailored to the farmers' seasonal cash flow may be an effective way to increase investments in agriculture and improve yields and profits.

Evidence from Soro Yiriwaso, a microfinance institution in Southern Mali,<sup>25</sup> has shown that the use of balloon

23 Tomoko Harigaya (2016). "Effects of Digitization on Financial Behaviors: Experimental Evidence from the Philippines."

24 Hull, E., & James, D. (2012). "Introduction: Popular Economies in South Africa" *Africa*, 82(1), 1-19.

25 Beaman, Lori, Dean Karlan, Bram Thuysbaert, and Christopher Udry (2015). "Self-Selection into Credit Markets: Evidence from Agriculture in Mali."

repayments (also called bullet repayments) in which the principal is paid in full at the end of the loan term (ideally after the farmer has been able to maximize the sale value of her crop) can increase the farmer's investments in cultivation (particularly fertilizer, insecticides and herbicides) as well as agricultural outputs (though no statistically significant increase in profits). Similarly, a study of maize farmers in Uganda<sup>26</sup> found that farmers were more likely to take on credit to purchase modern inputs when loan repayment could be deferred until after harvest.

It is not only credit products that can benefit from restructuring to fit into the farmer's agriculture-driven liquidity cycle. A study of contract farmers in Kenya<sup>27</sup> found that delaying the payment of insurance premium until post-harvest (effectively providing credit to cover the cost of the policy until a time of greater liquidity) increased uptake from 5 percent to 72 percent, with a more pronounced effect for poorer farmers. In general, any services provided to farmers, whether financial or other value-added services, need to respond to the specific needs at varying points in the agricultural cycle, as shown in the diagram below.

## Agricultural DFS needs to invest in understanding customer behavior

Because of the nature of rural populations and agricultural activities, it is not enough for FSPs to transplant models and products that have gained traction in urban environments. Successful implementations tend to design services from the ground up, based on a thorough understanding of the needs, behaviors, and incentives of rural customers.

For example, loan officers or field agents and customers often need to travel long distances via poor infrastructure to reach each other. This can be costly for both parties. Anecdotal evidence from Tanzania<sup>28</sup> suggests that the cost of traveling to the nearest agent to access a loan effectively reduces the size of the loan before the farmer can spend the money on agricultural inputs. As a result, farmers who accessed digital loans typically used them to purchase airtime credit, small household items, or medicines, rather than agricultural purposes. This insight was only gathered after a thorough journey mapping exercise to identify constraints to DFS adoption.

**Table 3**


	DECIDING	SEEDING	PLANTING	GROWING	HARVESTING AND STORING	SELLING
<b>Digital financial services</b>	Money-management	Working capital, input financing	Investment in fertilizer, machinery, labor	Savings and insurance for resilience	Investment in machinery, labor, storage	Digital payments, commitment savings
<b>Value added services</b>	Market prices, yield info, disease info	Best farming practices	Irrigation, machinery, fertilizer	Crop management info, pest management	Storage linkages, market info	Market linkages, prices

Source: Adapted from Nathan Associates (2015) "The intersection of agricultural and financial markets"

26 Matsumoto, T., Yamano, T., & Sserunkuma, D. (2013). "Technology adoption in agriculture: evidence from experimental intervention in maize production in Uganda".

27 Lorenzo Casaburi and Jack Wills (2017). "Time vs. State in Insurance: Experimental Evidence from Contract Farming in Kenya."

28 Institute for Smallholder Finance (2016). "Financial Inclusion Fit to Size: Customizing Digital Credit for Smallholder Farmers in Tanzania."



If DFS interventions are to succeed in agriculture, development practitioners and private companies working in the agriculture space need a firm understanding of the context and behaviors of rural populations. For example, the common practice of investing in livestock even when real return on investment is negative implies a demand for illiquid savings products.<sup>29</sup> The challenge for DFS providers is how to match and improve upon the specific benefits that are provided by the current non-digital solution.

Musoni, with help from USAID, has invested heavily in understanding the cashflows of farmers to design for them.<sup>30</sup> Working with Grameen Foundation, Musoni went through an intensive, human-centered design-based research process to better understand the unique seasonal financial needs of Kenya's agricultural households. The design phase included focus groups and interviews with both current Musoni customers and other Kenyan farmers who were not customers of Musoni or any other institution. The result was Kilimo Booster, a loan product with flexible terms and a customizable grace period based on a farmer's seasonal cash flow.

### 3.3 OPERATIONAL FACTORS

#### DFS needs to make field force more productive, not replace it

Multi-country evidence across a range of projects has demonstrated the importance of effective human touch points. An on-the-ground field force, i.e., loan officers, mobile money agents or other field officers, are usually the de facto interface between a farmer

or rural household and a financial institution. Even for a product that is notionally digital, it is likely that an agent or officer (who may or may not be an employee of the FSP) will be responsible for some or all of the FSP's interactions with the farmer, including marketing or raising awareness, filling out applications, verifying identity, handling deposits and withdrawals, helping customers understand how to use products, and ongoing account servicing and problem solving. The agent may also serve the role of extension officer, providing agricultural advice and market information. The human touch point is particularly important where general trust in the financial sector is low.<sup>31</sup>

DFS interventions need to make field force more productive. Musoni<sup>32</sup> is a good example of this. By digitizing the customer enrollment and cashflow analysis process, their loan officers now only need to ask what crop the farmer is growing and on how much land, and the cash flow model automatically calculates the expected yield and market price for that crop, based on localized data. One Acre Fund<sup>33</sup> found that by providing their field officers with a package including a Samsung tablet pre-loaded with a survey and basic data, a solar charging station, and some training, the field officers enrolled an average of eight percent more clients. The approach of Digital Green, a provider of digitized extension services, has been to build their services on top of existing people-based extension systems, with the goal of amplifying the field staff's effectiveness.

29 Anagol, Santosh and Etang, Alvin and Karlan, Dean S. (2014). "Continued Existence of Cows Disproves Central Tenets of Capitalism?" Yale University Economic Growth Center Discussion Paper No. 1031.

30 Feed the Future case study: Musoni Kenya and Kilimo Booster.

31 CGAP (2018). "Using Satellite Data to Scale Smallholder Agricultural Insurance."

32 Feed the Future case study: Musoni Kenya and Kilimo Booster.

33 Feed the Future case study: One Acre Fund's integration of digital tools in Kenya.



**Figure 1. Five critical components of change management**

1	2	3	4	5
Involve department heads from the beginning to enhance buy in and avoid internal resistance	Outline viability through a robust financial model and sound business plan	Update policies and procedures expeditiously to reflect the change	Organize staff training and clearly define roles to avoid confusion and unnecessary duplication of efforts	Provide staff incentives for adoption and sustained usage

Source: IFC Alternative Delivery Channels and Technology Handbook

### Importance of change management

If the job of field officers is likely to be significantly changed by the advent of digital financial services, then due consideration needs to be given to the change management around this. In Kenya,<sup>34</sup> the Connected Farmer Alliance (CFA) implemented an ambitious program to digitize the flow of money and information along the nut value chain but found the field staff resistant to change and lacking motivation, due to poor communication and lack of attention to change management. In their attempt to digitize agricultural payments in Uganda,<sup>35</sup> CGAP found that over-estimates of incentives and lack of attention to change management resulted in staff preferring to disburse payments in cash rather than digital.

Change management in DFS interventions can easily overlooked amid the excitement of an innovative new product. However, many projects have failed due to lack of attention to the details of how change happens. The Alternative Delivery Channels and Technology Handbook<sup>36</sup> produced by the IFC (International Finance Corporation) provides a good summary of the five critical components of change management.

### Digitization goes beyond customer interface

The institutional processes behind providing financial services to a rural customer can take a long time to implement. Digitization is most commonly talked about in the context of product delivery (e.g., the mobile phone facilitating money transfers), but it is also relevant for aspects such as marketing, customer origination, product design, data management and collection/payout. To realize the full benefits of digitization, it is important to eliminate any remaining analog processes that may cause bottlenecks.

A common anecdotal learning from DFS implementations in agriculture is that the end-to-end flow of data needs to be digitized. A sophisticated analytics platform is redundant if data collection during loan origination still requires a paper, pen and clipboard. Lack of digitized data flows often limits innovative new data-driven models.

<sup>34</sup> TechnoServe (2016). "Connected Farmer Alliance: Assessing the impact of a commercial mobile agriculture (mAgri) solution."

<sup>35</sup> Amani M'Bale, Rashmi Pillai, and Nathan Were. (2018). "Digitizing Agricultural Payments" CGAP Working Paper.

<sup>36</sup> IFC Handbook available at <https://openknowledge.worldbank.org/handle/10986/25980>.



### 3.4 INNOVATION AND GROWTH FACTORS

#### DFS interventions in agriculture need time to scale

The expectation of most technology-driven innovations is that they hope to follow a sharp growth trajectory. This is hard to achieve in the context of poor, rural economies. Technologies tend to scale quickly among connected populations facing similar problems, while agricultural populations are generally characterized by low connectivity and heterogeneous needs.

Even when DFS innovations for agriculture show early promise, those that reach scale tend to do so relatively slowly. MyAgro started operations in 2011 with a trial with 240 farmers. It has taken five years, and over \$6 million<sup>37</sup> to reach 30,000 farmers. Over 80 percent of this money has been philanthropic (the remainder being earned revenues). While there are plans to reduce the

dependence on grant money, the importance of subsidy in building a successful business model is evident. The economics of smallholder finance do not initially make commercial sense, so intelligent use of subsidy will continue to be an important criterion for success.

Philanthropic money provides space for experimentation, iteration, failure, and learning. This is particularly true in the insurance sector, where there is scant evidence that smallholder farmers are willing to pay actuarially fair prices for insurance policies. There is justification here for donor subsidy to build the market and prime demand. But almost ten years since the first promising results from Kilimo Salama and Index Based Livestock Insurance (IBLI) in Kenya, we are still waiting for the first commercially-viable index insurance product for smallholder farmers.

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<sup>37</sup> Data extracted from MyAgro website and annual/quarterly reports.

## SECTION 4: THE ROLE OF CONNECTIVITY

### Current state of connectivity

Digital connectivity is a critical component of any successful implementation of DFS in agriculture.

Financially excluded farmers tend to live in rural areas where mobile network and data connectivity tend to be unreliable or non-existent.

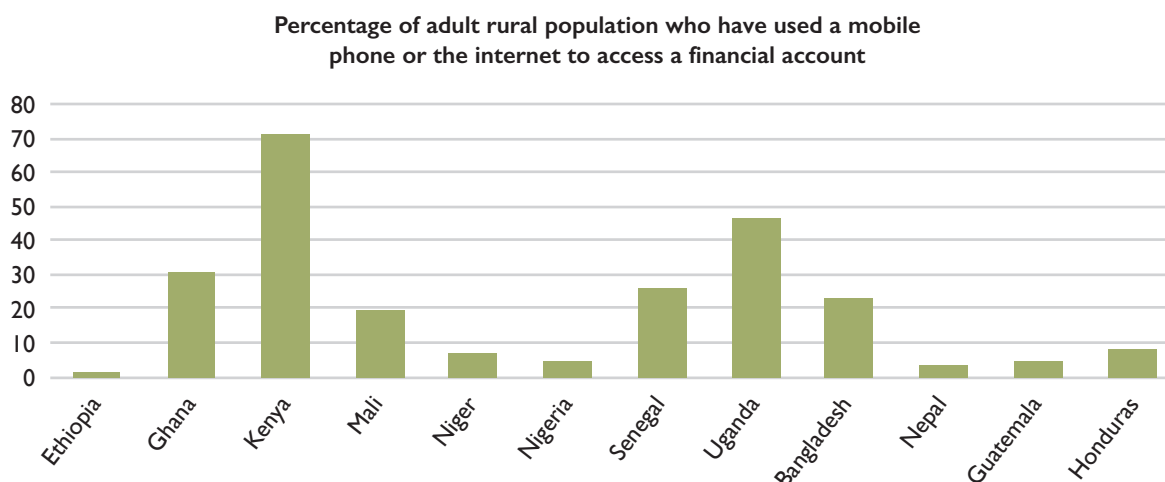
Of the GFSS target countries, only in Kenya have more than half of the rural population used a mobile phone or the internet to access a financial account.<sup>38</sup> In most countries, more than 90 percent of the rural population have never used a digital medium to access a financial account.

This is an indication of the challenges around rural connectivity that can hinder the growth of DFS in agriculture. For a digital currency to be more useful than

cash, rural customers need to have faith in the utility of the service whenever they need it. The value of a digital account decreases if there is no network signal when they want to make a transaction.

There is evidence that the situation around rural connectivity is improving. In the three years between the 2014 and 2017 Global Findex panels, the proportion of the rural population who made or received digital payments in the past year increased in all GFSS target countries bar Nigeria. The data suggest that on average across the twelve countries, an additional four percent of the rural population was being brought into the mobile payments ecosystem every year. The growth was particularly pronounced in West Africa (apart from Nigeria) and Bangladesh.

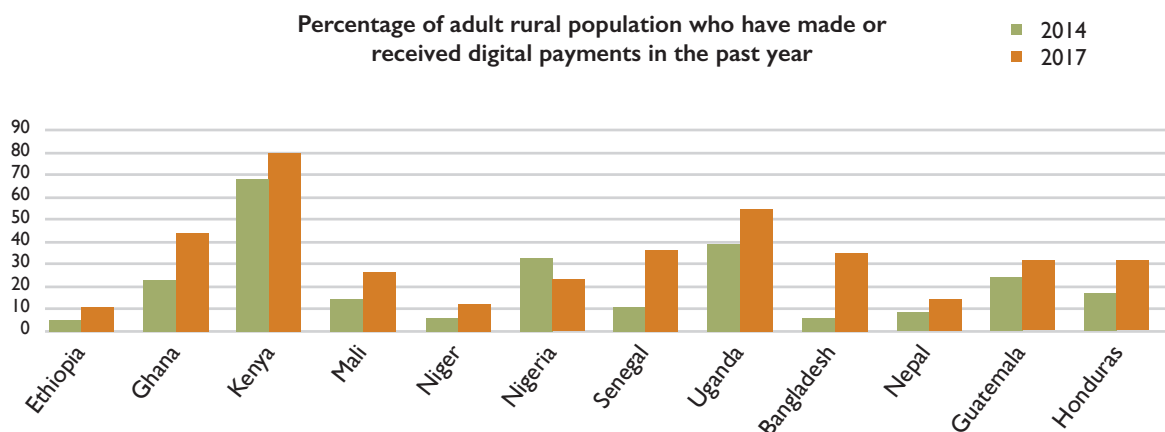
**Figure 2**



Source: Global Findex 2017

38 Global Findex data.

**Figure 3**



Source: Global Index 2014 and 2017

The fact remains however, that in countries like Ethiopia, Niger and Nepal, more than 80 percent of the rural population are not using even basic digital payments. And when it comes to agricultural payments, the situation is even more stark. The penetration of DFS in agricultural value chains remains very low. Of the GFSS target countries, only in Kenya and Uganda have more than 10 percent of the population received payments for agricultural products through a mobile phone.<sup>39</sup> The average of the remaining countries is two percent.

### Looking forward

There is some optimism that growing smartphone penetration and increased rural connectivity in emerging markets will be the game changer for digital financial services and agriculture. The offerings provided by a smartphone and an internet connection can be orders of magnitude greater than a simple USSD-based offering on a feature phone.

When M-PESA launched in Kenya in 2007, mobile

phone penetration was at 30 percent, and by 2009, when the service really took off, there were already 48 mobile connections for every 100 Kenyans.<sup>40</sup> In contrast, we are not yet seeing a significant impact of smartphones on financial inclusion. Smartphone penetration in Kenya is 38.8 percent and in Nigeria it is 35 percent (with significant urban bias)<sup>41</sup> and we have not yet reached the inflection point at which the next generation of smartphone-based DFS models are able to achieve rapid growth, let alone for farmers.

Elsewhere, in the same way that many developing countries leapfrogged landline connectivity by going straight to mobile, countries like Burma seem to be leapfrogging feature phones to go directly to smartphones. Recent estimates suggest that 55 percent of Myanmar's 50 million mobile connections have access to broadband,<sup>42</sup> opening up possibilities for more sophisticated engagement between farmer and FSPs.

As smartphone penetration grows and access becomes less of a constraint, challenges around design and

<sup>39</sup> Global Findex data

<sup>40</sup> International Telecommunication Union, World Telecommunication/ICT Development Report and database.

<sup>41</sup> GSMA 2018 retrieved from: <https://www.gsmainelligence.com/>

<sup>42</sup> We Are Social "Digital in Southeast Asia in 2017" report, downloaded from <https://wearesocial.com>.



delivery will emerge. The user interface (UI) for rural farmers will differ from the interface for wealthier and urban customers. Providers will need to design and build for customers with a range of local languages and dialects, and varying levels of financial and general literacy, and for phones with limited connectivity and storage space. At the same time, continued usage of smartphones in rural areas will lead to the development of data streams and digital profiles that, when combined with data on local agronomic conditions, could help FSPs overcome some of the challenges around information asymmetries in financing farmers.



## SECTION 5: RECOMMENDATIONS

The following recommendations are based on a thorough review of academic and programmatic documentation around what has worked to achieve impact for smallholder farmers in the implementation of DFS programs, as well as anecdotal evidence from experts in the field. It is not a comprehensive list of recommendations, but rather an indication of where USAID may look to increase the impact of programming in this space.

### 5.1 STRATEGIC RECOMMENDATIONS

#### **DFS for agriculture will require long term, market building investments.**

To build models with greater impact over time, more investments will need to be made in the market infrastructure and enabling environment for DFS. As stated in the [Principles for Digital Development](#), the sustainability of programs, platforms, and digital tools is essential to maintain user and stakeholder support, as well as to maximize long-term impact. Information asymmetries and transaction costs in agricultural finance are significant, and there are no quick fixes.

#### **Subsidize risk and innovations.**

A key role of donor funding is to provide the risk capital for innovation. The capital provided by development money fills an important funding gap for testing new products or business models that can motivate service providers to help drive consumers' adoption of digital

payments. There is a lot of innovation happening on the supply side and even if only a small percentage of projects get past proof of concept, they may substantially push out the innovation frontier. USAID's Development Innovation Ventures (DIV) provides an excellent platform to fund greater innovation in this space.

#### **Form strategic partnerships for solving complex problems.**

High quality relationships with aligned incentives are a critical success factor for successful implementation of DFS in agriculture. Evidence indicates that, to achieve impact in this difficult environment, stakeholders will need to work together. In selecting partners, [USAID's Fintech Partnerships Checklist](#)<sup>43</sup> provides a valuable framework for forging effective partnerships.

### 5.2 PROCESS-RELATED RECOMMENDATIONS

#### **Segmentation and customer-focused design are critical.**

The global smallholder population is so diverse that there will be no one-size-fits-all solutions. Building on the CGAP segmentation framework to identify the key attributes of target populations and then designing specifically for their needs is a good way to start. The role of the donor in this case should be to support the early stages of R&D, customer profiling, and initial design.

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<sup>43</sup> <https://www.usaid.gov/documents/15396/checklist-fostering-private-sector-investment-digital-finance>.





ADVANCE II

### **Digitization of the customer interface is only part of the solution.**

To understand why poor farmers do not use digital services when they are available (and even subsidized), we need to understand whether the constraints are on the demand side (e.g., customers are too poor or lack the financial literacy to use the services) or the supply side (e.g., products are poorly designed for the needs of farmers and rural households). In most cases, there are likely factors on both sides of the market.<sup>44</sup> Digitization can reduce transaction costs, but to reach its full potential, it needs to solve many more issues in the customer journey. This includes reducing information asymmetries and enabling FSPs to develop profiles of smallholders' needs, incentives, and ability or willingness to pay for financial services.

## **5.3 PRODUCT-RELATED RECOMMENDATIONS**

### **Pay more attention to savings.**

The evidence around commitment savings (particularly from Malawi and Tanzania) suggests that farmers will

save some of their illiquid income if they are provided with access to well-designed savings products. Savings can also act as an effective on-ramp to broader financial services as they provide a relatively simple way for farmers to regularly engage with and trust a financial institution, and they provide the financial institution with some data on a farmer's cashflows and ability to make regular deposits.

### **Make savings and insurance relevant to farmers' goals.**

Farmers value saving money. However, savings accounts often become de facto "insurance." When an emergency occurs, such as a death in the family or a medical condition, farmers make huge financial sacrifices. They withdraw from—or liquidate—their savings to cover these significant expenses. This is particularly true for poorer farmers with weaker connections to value chains. Tying savings usage directly to farmers' aspirations (e.g., buying inputs or paying for children's education) may provide more compelling reasons for farmers to engage with and adopt DFS.

44 Pascaline Dupas, Dean Karlan, Jonathan Robinson, and Diego Ubfal (2018) "Banking the Unbanked? Evidence from Three Countries."

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